

What is Claimed Is:

1. A laminated perpendicular magnetic recording medium, comprising a non-magnetic substrate and at least a pair of polycrystalline, vertically stacked, spaced-apart perpendicular magnetic layers supported thereon, wherein each of said magnetic layers has substantially the same preferred out-of-plane crystal growth orientation and the grains of at least two of said magnetic layers are vertically uncorrelated with each other.
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2. The medium as claim 1, wherein said at least one pair of stacked magnetic layers are vertically spaced apart by a non-magnetic, amorphous or nano-crystalline spacer layer.
3. The medium as in claim 2, wherein said magnetic layers are comprised of substantially the same material.
4. The medium as in claim 2, wherein said magnetic layers are comprised of different materials.
5. The medium as in claim 2, wherein the lattice parameters of said magnetic layers are substantially the same.
6. The medium as in claim 2, wherein the lattice parameters of said magnetic layers are different.
7. The medium as in claim 2, wherein each of said magnetic layers is comprised of an *hcp* material having a <0002> preferred out-of-plane growth orientation and a [0002] lattice parameter.
8. The medium as in claim 7, wherein each of said magnetic layers comprises a layer of a Co-based alloy material having a thickness from about 3 to about 20 nm and said non-magnetic spacer layer comprises a layer of an

amorphous or nano-crystalline Ti-based alloy material having a thickness from
5 about 1 to about 20 nm.

9. The medium as in claim 7, wherein each of said magnetic layers is comprised of substantially the same or a different *hcp* <0002> material and the [0002] lattice parameter of each of said layers is substantially the same or different.

10. The medium as in claim 2, wherein each of said magnetic layers is comprised of an *fcc* material having a <111> preferred out-of-plane growth orientation and a [111] lattice parameter.

11. The medium as in claim 10, wherein each of said magnetic layers comprises a multi-layer material selected from the group consisting of Co/Pt, Co/Pd, Fe/Pt, and Fe/Pd having a thickness from about 3 to about 20 nm, and said non-magnetic spacer layer comprises a layer of an amorphous or nano-crystalline
5 Ti-based alloy material having a thickness from about 1 to about 20 nm.

12. The medium as in claim 10, wherein each of said magnetic layers is comprised of substantially the same or a different *fcc* <111> material and the [111] lattice parameter of each of said layers is substantially the same or different.

13. The medium as in claim 1, further comprising a seed layer in contact with a lower surface of at least one of said magnetic layers, said seed layer comprising a material having a lowest interfacial energy with said at least one magnetic layer when the latter has the desired preferred out-of-plane crystal
5 growth orientation.

14. The medium as in claim 13, where said seed layer comprises a layer of an amorphous material selected from the group consisting of Ti-based alloys, FeCo alloys, FeNi alloys, CoNi alloys, and InSnO (ITO) materials and having a thickness from about 1 to about 400 nm or a layer of a polycrystalline

5 material selected from the group consisting of Ru, Ti, Ag, Au, Cu, and alloys comprised of a *fcc* or *hcp* material and having a thickness from about 1 to about 20 nm.

15. The medium as in claim 13, further comprising a soft magnetic underlayer in contact with a lower surface of a lowermost seed layer.

16. A method of fabricating a laminated perpendicular magnetic recording medium, comprising steps of:

- (a) providing a non-magnetic substrate having a surface; and
- 5 (b) forming at least a pair of polycrystalline, vertically stacked, spaced-apart, perpendicular magnetic layers over said surface, such that each of said magnetic layers has substantially the same preferred out-of-plane crystal growth orientation and the grains of at least two of said layers are vertically uncorrelated with each other.

17. The method according to claim 16, wherein:

step (b) comprises forming a non-magnetic, amorphous or nano-crystalline spacer layer between vertically adjacent ones of said magnetic layers.

18. The method according to claim 17, wherein:

step (b) comprises forming said magnetic layers as comprised of substantially the same material or of different materials, and the lattice parameters of said magnetic layers are substantially the same or are different.

19. The method according to claim 18, wherein:

step (b) comprises forming each of said magnetic layers as comprised of an *hcp* material having a <0002> preferred out-of-plane growth orientation and a [0002] lattice parameter.

20. The method according to claim 19, wherein:

step (b) comprises forming each of said magnetic layers as comprised of a

layer of a Co-based alloy material having a thickness from about 3 to about 20 nm and forming said non-magnetic spacer layer as comprised of a layer of an 5 amorphous or nano-crystalline Ti-based alloy material having a thickness from about 1 to about 20 nm.

21. The method according to claim 18, wherein:

step (b) comprises forming each of said magnetic layers as comprised of an *fcc* material having a <111> preferred out-of-plane growth orientation and a [111] lattice parameter.

22. The method according to claim 21, wherein:

step (b) comprises forming each of said magnetic layers as comprised of a multilayer material selected from the group consisting of Co/Pt, Co/Pd, Fe/Pt, and Fe/Pd having a thickness from about 3 to about 20 nm, and forming said non- 5 magnetic spacer layer as comprised of a layer of an amorphous or nano-crystalline Ti-based alloy material having a thickness from about 1 to about 20 nm.

23. The method according to claim 16, wherein:

step (b) further comprises forming a seed layer in contact with a lower surface of at least one of said magnetic layers, said seed layer comprising a material having a lowest interfacial energy with said at least one magnetic layer 5 for when the latter has the desired preferred out-of-plane crystal growth orientation.

24. The method according to claim 23, wherein:

step (b) comprises forming said seed layer as comprised of a layer of an amorphous material selected from the group consisting of Ti-based alloys, FeCo alloys, FeNi alloys, CoNi alloys, and InSnO (ITO) materials and having a 5 thickness from about 1 to about 400 nm or a layer of a polycrystalline material selected from the group consisting of Ru, Ti, Ag, Au, Cu, and alloys comprised of a *fcc* or *hcp* material and having a thickness from about 1 to about 20 nm.

25. The method according to claim 23, wherein:
step (b) still further comprises forming a soft magnetic underlayer in
contact with a lower surface of a lowermost seed layer.